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RESULTS OF FAA CABIN OZONE MONITORING PROGRAM IN COMMERCIAL AIR--ETC(U)
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U.S. Department of Transportation
Federal Aviation Administration

Results of FAA Cabin Ozone Monitoring Program in Commercial Aircraft in 1978 and 1979

Office of Environment and Energy
Washington, D.C. 20591

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James W. Rogers

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16. Abstract

This report contains descriptions of the instrumentation and procedures used during the Federal Aviation Administration (FAA) program to measure the concentration of ozone in the cabins of commercial aircraft on revenue flights during 1978 and 1979.

Based on the limited data set obtained, the following conclusions are stated:

1. The data set confirms the fact that high concentrations of ozone are at times present in commercial aircraft cabins;

2. The data verifies the increased occurrence of excessive ozone exposure for flights at high altitudes and latitudes;

3. The long-range aircraft (B-747, DC-10, L-1011, DC-8 and B-707), which generally fly at higher altitudes, are more likely to encounter excessive ozone concentrations than short-range aircraft (B-727, B-737 and DC-9).

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PREFACE

This document was prepared by the Federal Aviation Administration, Office of Environment and Energy to present the results of an internal program to measure the ozone concentration on commercial aircraft. The author is indebted to all the Federal Aviation Administration flight inspectors who obtained the data presented in this report. In particular, program initiation and leadership were provided by Wes Euler and Jerry Davis of the New York Air Carrier District Office and Frank Wally of the Honolulu Flight Standards District Office.

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INTRODUCTION

During the winter of 1976, the Federal Aviation Administration (FAA) received several complaints of physical discomfort from crewmembers and passengers on high-altitude flights. By March 1977, information from air carrier inspectors, air carriers and aircraft manufacturers led the FAA to believe ozone gas was the probable cause of many of the crewmember and passenger complaints.

Five major steps were taken during the remainder of 1977 to further investigate this possibility and to provide interim procedures to reduce the adverse health effects if ozone was the cause of the complaints.

1. The FAA Flight Standards Service published on July 21, 1977, Advisory Circular No. 00-52 (1) which defined ozone irritation, discussed its causes and symptoms, and described a means of dealing with the problem should it occur in flight.

2. A research project was initiated on May 26, 1977, by the FAA's Civil Aeromedical Institute to study the health effects of exposure to ozone in the aviation environment. Respiratory, hematologic, visual, and performance parameters were assessed. In support of this research, an extensive literature search and review of complaints from flight crewmembers were undertaken.

Two reports have been published as a result of this project (2,3). The first study (2) concluded that there are no significant effects attributable to ozone for exercising and sedentary healthy people exposed to 0.20 parts per million by volume (ppmv), sea level eqivalent (SLE) ozone for 4 hours. All exercising subjects showed some effects of 0.3 ppmv, SLE, ozone while sedentary subjects did not. The conclusion reached was that the threshold for ozone effects was at some level between 0.30 and 0.20 ppmv, SLE. The second study (3) concluded that smoking does mitigate the pulmonary symptoms of ozone exposure. The data obtained also generally confirmed the conclusions of the first study that 0.30 ppmv, SLE, ozone is at or near the threshold for adverse effects of ozone, and that there is a good deal of individual variability.

3. An Advance Notice of Proposed Rulemaking (ANPRM), No. 77-22, was issued on September 29, 1977 (4), to seek information from air carriers, aircraft manufacturers, crewmember organizations, high-altitude research organizations and other interested persons concerning ozone contamination.

As a result of the ANPRM, a Notice of Proposed Rulemaking (NPRM), No. 78-15, was issued on October 5, 1978 (5), and a final rule published on January 21, 1980 (6). The final rule applied to Federal Aviation Regulations (FAR) Part 25 - Airworthiness Standards: Transport Category Airplanes and Part 121 - Certification and Operations: Domestic, Flag, Supplemental Air Carriers and Commercial Operators of Large Aircraft.

Under Part 25, a new paragraph 25.832, Cabin Ozone Concentration, was established which stated:

> The airplane cabin ozone concentration during flight above flight level 180 must be shown not to exceed -
> (1) 0.25 parts per million by volume, sea level equivalent, at any point in time; and
> (2) 0.1 parts per million by volume, sea level equivalent, time-weighted average during any 3-hour interval.

Under Part 121, a new paragraph 121.578, Cabin Ozone Concentration, was added which stated:

> ...after February 20, 1981*, no certificate holder may operate a transport category airplane above flight level 180 unless it has successfully demonstrated to the Administrator that the concentration of ozone inside the cabin will not exceed -
> (1) 0.25 parts per million by volume, sea level equivalent, at any point in time; and
> (2) For each flight segment that exceeds 4 hours, 0.1 parts per million by volume, sea level equivalent, time-weighted average over that flight segment.

Reference (6) should be consulted for the complete rule and supplementary information. An Advisory Circular No. 120-38 was issued on October 10, 1980 (7). This advisory circular provides guidance concerning acceptable means, but not the only means, for an air carrier to demonstrate compliance with the maximum permissible cabin ozone concentrations established by Section 121.578 of the FAR.

4. The National Aeronautics and Space Administration (NASA) which had instrumentation placed on B-747 airliners to measure constituents of the upper atmosphere, including ozone, added ozone monitors to simultaneously measure the ozone in the atmosphere and in the aircraft cabin.

The results of these measurements showed that a significant portion of the atmospheric ozone did enter the aircraft cabin at concentrations which could have possible adverse health effects (8, 9, 10, 11).

5. The FAA Office of Environmental Qualtity (presently the Office of Environment and Energy) initiated a study of available data on ozone concentrations at flight levels to provide a convenient summary of the best current estimate of the average atmospheric ozone at flight altitudes and its variability with time and space.

The summary tabulation derived from ozonesonde balloon data showed the high atmospheric ozone concentrations which are encountered at flight levels during the winter and spring seasons (12).

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*On January 19, 1981, all operations conducted with aircraft other than B-747SP aircraft were granted an exemption from the provisions of paragraph 121.578 of the FAR until February 20, 1982, subject to conditions and limitations published in the Federal Register, (46 FR 11648), February 9, 1981.

To verify the data in the summary tabulation (12) on aircraft other than the B-747's, the FAA organized a program to measure the concentration of ozone in the cabins of commercial aircraft during revenue flights. This report contains descriptions of the instrumentation and procedures used during this measurement program and the results obtained during spring of 1978 and 1979.

INSTRUMENTATION

Measurements of the cabin ozone concentrations were obtained with a Model 2000 portable ozone meter manufactured by Columbia Scientific Industries (CSI) of Austin, Texas. The meter utilized the phototmetric detection of the chemiluminescent light resulting from the flameless reaction of ethylene gas with ozone. For aircraft operation, ethychem gas is used, which is a nonflammable mixture consisting of 90% carbon dioxide and 10% ethylene. Power is obtained from a set of battery packs which allowed operation completely independent of the aircraft. Data are stored on a strip chart recorder for later analysis. Figure 1 shows the complete monitoring system used by the FAA.

The ozone meters were calibrated initially by using the output of a CSI Model 1000-1 ozone generator. It was known that this did not provide an adequate calibration for precision measurements. The instruments were not procured until March 1978. An absolute calibration could not be obtained before initiating the program to obtain data during the spring when the highest ambient ozone concentrations occur. Lack of an absolute calibration is reflected in the large estimated errors reported with the data obtained during 1978.

Before the ozone monitoring program was resumed in 1979, the instruments were calibrated against the secondary transfer standard at the NASA Lewis Research Center. The standard is the same one used for ozone measurements obtained during NASA's Global Air Sampling Program. This calibration showed that the FAA instruments did have an error in the ozone reference values used during analysis of the 1978 results, but the measured difference fell within the error bars reported with the data. Calibration continued at periodic intervals during the 1979 measurement program and indicated stable instrument operation.

PROCEDURES

The purpose of the FAA ozone monitoring program was to investigate the magnitude of the ozone levels in the cabins of a variety of commercial aircraft on a number of different flight routes during the season of enhanced ambient ozone values. Measurements were made during 1978 by FAA flight inspectors based in New York City and Honolulu on routine inspection flights. In 1979, flight inspectors at other locations were also used. During the ozone monitoring flights, the flight inspectors operated the instrumentation, completed the Ozone Data Collection Form shown in Figure 2 and, when possible, obtained copies of the air carrier's flight plan and meteorological charts.

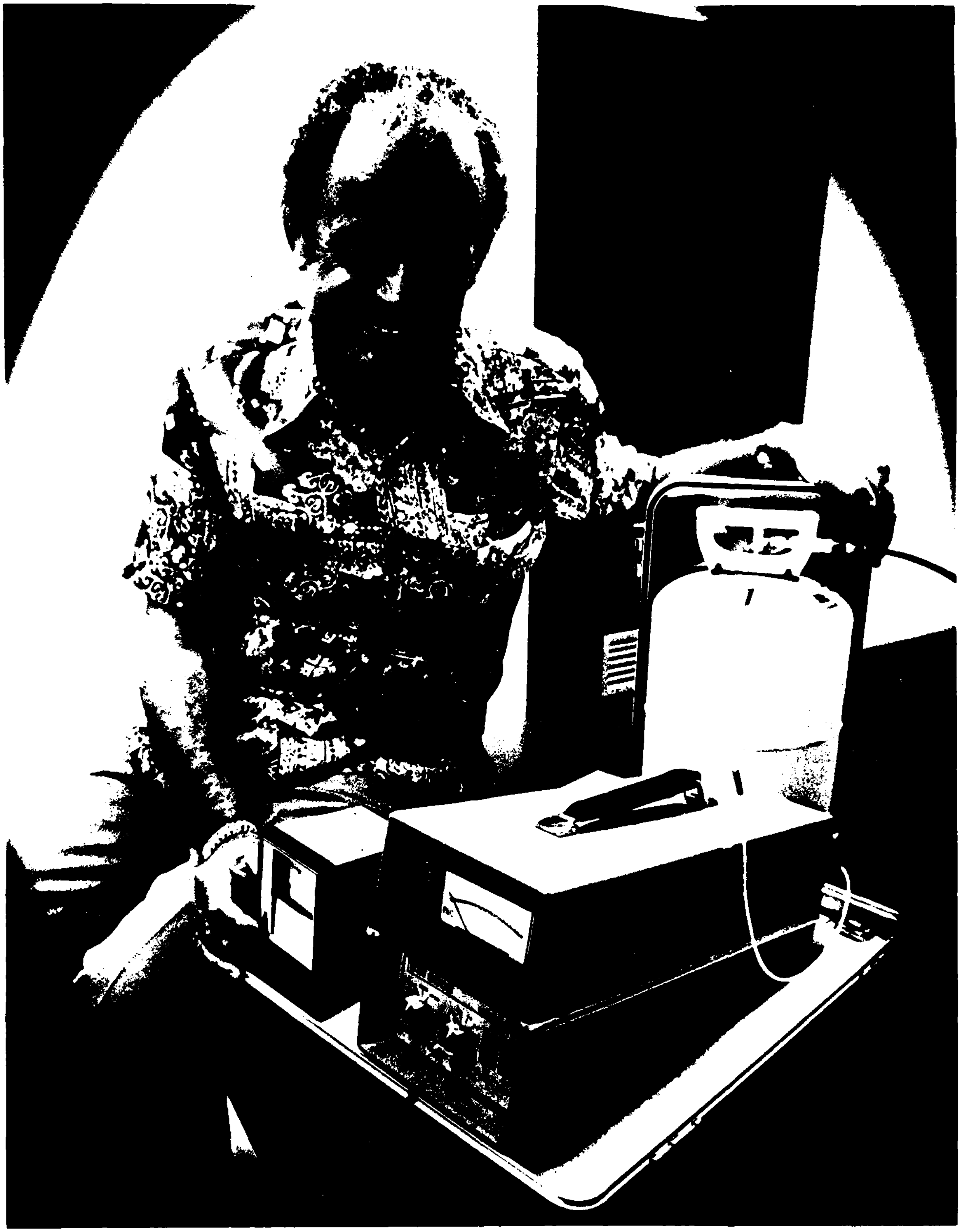

FIGURE 1. Frank Wally, an air-carrier inspector from the Honolulu Flight Standards District Office, is seen with the Portable Ozone Monitoring System used during the FAA Cabin Ozone Monitoring Program during 1978 and 1979.

OZONE DATA COLLECTION FORM

Flt. No./Date ________ Modeswitch Sample ________ GMT Modeswitch Zero ________ GMT

From/To ________ T.O. Time ________ GMT Power Off ________ GMT

Type A/C-N No. ______ Landing Time ________ GMT

Captain's Name: ____________________ Observer's Name: ____________________

POSITION & GMT	FLIGHT ALTITUDE	CABIN ALTITUDE	SAT	ZONE TEMP CABIN	HUMIDITY	TROP HEIGHT

Instrument intake location
in aircraft ____________________

Remarks:

Air flow around unit
intake ____________________

Figure 2. Ozone Data Collection Form Completed By The FAA Flight Inspectors During the FAA Ozone Monitoring Program.

The ozone monitors were flown to obtain data on a representative set of flight routes and aircraft types. During 1978, the emphasis of the program was on the long-range aircraft where the majority of complaints of physical discomfort had originated. The 1979 program concentrated on short-range flights to investigate the extent of the problem on these routes and aircraft.

RESULTS

The data obtained during the monitoring flights were sent to the FAA's Office of Environment and Energy for data reduction and analysis. The ozone concentrations in the aircraft cabins were determined at cabin altitude and sea level for the maximum value, maximum one-hour average, and average value over the monitoring time (which normally was the flight time).

The results of the monitoring program are shown in Table 1 for the spring of 1978 and Table 2 for the spring of 1979. Information presented with the ozone values are the measurement date, flight number, aircraft type and number. Airport identifiers are used to show the flight origination and destination. Table 3 defines the airport identifiers used in Tables 1 and 2 and the geographical coordinates of the airports. The minimum and maximum flight level (FL) and cabin altitude (CA) after climb are presented. Lastly, the total flight times and actual ozone monitoring times are given with the location of the ozone monitor inlet. Errors associated with the 1978 data (Table 1) are ± 0.025 ppmv and ± 0.01 ppmv for the 1979 data (Table 2).

Analyzed in terms of the FAA ozone concentration limits established by Section 121.578 of the FAR's, 17 of 157 (10.8%) of the flights would have violated either the maximum limit or the time-weighted average limit or both. Eleven of 157 (7.0%) would have exceeded the maximum limit and 10 of 49 (20.4%) would have exceeded the time-weighted average limit. Table 4 shows the breakdown of the results by aircraft type.

Since aircraft cabin ozone contamination is a variable which depends on both the altitude and latitude flown, the data can be presented as a function of these two variables. Figure 5 shows the number of flights and those which would have exceeded the limits in Section 121.578 of the FAR's for each aircraft type at the maximum flight altitude and maximum latitude flown. Figure 6 is a similar presentation summarizing all monitored flights.

CONCLUSIONS

The number of flights which were monitored is by no means enough to perform a statistical analysis of excessive ozone concentration occurrence. An increase in the number of flights by orders-of-magnitude would be required to statistically determine the ozone occurrence with the resolution in altitude (2000 feet), latitude (5 degrees) and time (monthly) required to define the problem.

However, based on the limited data set obtained, the following conclusions can be stated.

1. Data have been obtained which confirms the fact that ozone concentrations in the cabins of commercial aircraft at times exceed the limits established by Section 121.578 of the FAR's. These limits were established based on ozone limits of the Environmental Prctection Agency and the Occupational Saftey and Health Administration; studies conducted at the FAA's Civil Aeromedical Institute; a review of research into the health effects of excessive ozone; and public comments in response to the NPRM.

2. The data verify the increased occurrence of excessive ozone exposure for flights at high altitudes and latitudes. The data in Figure 6 shows that 16 of 98 flights at latitudes greater than 37 1/2 degrees north and flight levels at or above 350, would have exceeded the maximum and/or time-weighted average limit, while only one flight out of 59 at the lower latitudes and altitudes would have exceeded them.

3. The long-range aircraft (B-747, DC-10, L-1011, DC-8 and B-707), which generally fly at higher altitudes, are more likely to encounter excessive ozone concentrations than short-range aircraft (B-727, B-737 and DC-9). None of the 58 short-range aircraft flights would have exceeded the limits established in Section 121.578 of the FAR's. However, 17 flights would have exceeded the limits during the 98 long-range aircraft flights. (It should be noted that most of the short-range aircraft flights were from January 11 to March 15, 1979. During this time period, none of the long-range aircraft flights monitored exceeded the established limits.)

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TABLE 1. Summary of Results Obtained During the FAA Cabin Ozone Monitoring Program, 1978

Date	Flight	A/C	Number	Orig.	Dest.	Min-Max *FL	Min-Max **CA	Max Ozone CA	Max Ozone SL	Max Hour Average CA	Max Hour Average SL	Flight Average CA	Flight Average SL	Flight Time	Monitor Time	Ozone Monitor Inlet Location
3-17-78	BNF501	B-747	N9666	DFW	HNL	350	41/51	0.16	0.14	0.14	0.12	0.07	0.05	7'35"	7'35"	cockpit fl level
3-17-78	BNF8	B-727	N421	DFW	JFK	330	48	0.22	0.18	0.17	0.14	0.10	0.08	2'45"	2'45"	cockpit fl level
3-23-78	UAL992	B-747	N4717	HNL	ORD	330/390	57	0.20	0.16	0.16	0.13	0.09	0.07	7'25"	7'25"	cockpit fl level
3-24-78	PAA160	B-747	N535	JFK	FRA	290/370	24/54	0.10	0.08	0.10	0.09	0.08	0.07	5'30"	5'30"	lounge fl level
3-25-78	PAA167	B-747	N903	LHR	JFK	310/390	34/62	0.29	0.23	0.24	0.20	0.19	0.16	7'20"	6'15:	lounge 12" fr fl
3-29-78	NWA3	B-747	N611	IAD	ORD	350/390	59/64	0.29	0.23	0.18	0.14	0.14	0.11	1'35"	1'35"	lounge eye level
3-29-78	NWA3	B-747	N611	ORD	HND	310/390	43/64	0.30	0.24	0.23	0.18	0.13	0.11	12'50"	12'00"	cockpit eye lev.
3-31-78	NWA22	B-747		HND	HNL	330/370	42/56	0.08	0.07	0.06	0.05	0.03	0.03	6'10"	5'00"	cockpit eye lev.
4-3-78	PAA20	B-747SP	N534	JFK	BAH	370/410	58/70	0.10	0.08	0.06	0.05	0.04	0.03	11'35"	10'38"	
4-5-78	PAA21	B-747SP	N534	BAH	JFK	310/390	48/62	0.05	0.05	0.03	0.03	0.01	0.01	13'00"	7'40"	lounge eye level
4-12-78	WAL500	DC-10	N902	HNL	LAX	330/370	46/61	0.13	0.11	0.10	0.08	0.07	0.06	4'40"	4'40"	cockpit eye lev.
4-13-78	BNF18	B-727	N443	AUS	JFK	370	63	0.08	0.06	0.07	0.05	0.06	0.04	2'25"	2'25"	1st cl. eye lev.
4-13-78	PAA3	B-747SP	N534	LAX	HND	350/430	48/72	0.10	0.08	0.09	0.07	0.06	0.05	10'40"	10'05"	1st cl. eye lev.
4-16-78	PAA12	B-747	N735	HND	SFO	330/390	39/60		batteries uncharged					9"00"		
4-17-78	WAL571	DC-10	N902	SFO	HNL	310	37	0.09	0.08	0.07	0.06	0.05	0.04	5'10"	4'49"	cockpit eye lev.
4-18-78	TWA702	B-707	N780	JFK	LHR	370	69	0.23	0.18	0.17	0.13	0.15	0.11	6'20"	6'20"	cockpit eye lev.
4-19-78	TWA701	B-707	N780	LHR	JFK	350/410	62/79	0.25	0.20	0.23	0.18	0.15	0.12	7'35"	7'05"	cockpit eye lev.
4-20-78	UAL173	DC-8	N8093	JFK	DEN	350	57	0.15	0.13	0.13	0.11	0.10	0.08	3'30"	3'30"	1st cl. eye lev.
4-20-78	UAL173	DC-8	N8093	DEN	SLC	350	56	0.04	0.03	0.02	0.02	0.02	0.02	1'02"	1'02"	1st cl. eye lev.
4-20-78	UAL173	DC-8	N8093	SLC	BOI	350	56	0.08	0.07	-	-	0.04	0.03	47"	47"	1st cl. eye lev.
4-20-78	UAL173	DC-8	N8093	BOI	SEA	390	70	0.21	0.17	0.09	0.07	0.09	0.07	1'02"	1'02"	1st cl. eye lev.
4-20-78	PAA1	B-747	N748	HNL	HND	350/390	47/62	0.08	0.07	0.07	0.06	0.05	0.04	7'50"	7'21"	1st cl. eye lev.
4-21-78	UAL40	DC-10	N3026	SEA	JFK	370	65	0.21	0.17	0.18	0.14	0.11	0.08	4'40"	4'00"	cockpit eye lev.
4-22-78	PAA800	B-747SP	N536	HND	JFK	330/410	40/67	0.15	0.12	0.14	0.12	0.10	0.08	11'35"	10'52"	coach eye level
4-25-78	NWA7	B-747	N606	JFK	SEA	390	64	0.18	0.15	0.16	0.13	0.09	0.07	5'10"	4'45"	1st cl. eye lev.
4-26-78	PAA124	B-747	N735	SEA	LHR	310/370	31/53	0.23	0.20	0.18	0.15	0.12	0.10	8'40"	8'40"	1st cl eye lev.
4-26-78	PAA801	B-747SP	N534	JFK	HND	350/430	48/72	0.09	0.07	0.08	0.06	0.06	0.05	13'10"	13'10"	coach
4-28-78	PAA800	B-747SP	N536	HND	JFK	370/390	55/61	0.02	0.02	0.01	0.01	0.01	0.01	12'25"	7'30"	lounge
4-28-78	NAL1	DC-10	N83	LHR	MIA	310/350	36/51	0.16	0.13	0.13	0.10	0.06	0.05	8'56"	8'56"	1st class
4-28-78	EAL26	L-1011	N331	MIA	JFK	370	65	0.04	0.03	0.04	0.03	0.03	0.02	2'22"	2'22"	1st class
5-2-78	UAL47	DC-10	N1803	JFK	SEA	350/390	53/66	0.17	0.14	0.15	0.12	0.11	0.09	5'08"	4'52"	1st cl. 6' fr fl
5-3-78	CAL981	DC-10	N68043	SEA	HNL	310/350	38/53	0.07	0.05	0.06	0.05	0.05	0.04	5'25"	5'25"	cockpit eye lev.
5-6-78	WAL740	B-720	N3167	HNL	ANC	350	57	0.33	0.27	0.21	0.17	0.11	0.09	5'22"	5'22"	1st cl. eye lev.
5-8-78	WAL639	B-720		ANC	SEA	370	63		recorder failure					2'58"		
5-12-78	PAA5	B-747SP	N536	SFO	HKG	310/410	40/67	0.33	0.26	0.27	0.21	0.07	0.06	14'09"	14'09"	coach eye level
5-16-78	PAA878		N654	HND	SFO	350/370	49/56		batteries uncharged					6'48"		
5-17-78	WAL571	DC-10	N901	SFO	HNL	350	57	0.09	0.08	0.02	0.01	0.01	0.01	5'04"	4'19"	cockpit eye lev.
5-23-78	BNF602	B-747	N602	DFW	LGW	330/370	42/54	0.24	0.20	0.21	0.17	0.10	0.09	8'25"	8'05"	cockpit
5-25-78	TWA761	B-747	N93107	LHR	LAX	330/390	42/64	0.29	0.23	0.26	0.21	0.17	0.14	10'50"	10'33"	
5-26-78	TWA904	L-1011	N31018	LAX	JFK	330/370	50/63	0.13	0.11	0.08	0.06	0.07	0.05	5'17"	5'17"	cockpit eye lev.
5-30-78	WAL742	DC-10	N908	HNL	ANC	330/350	46/53		recorder failure					5'11"		
5-31-78	WAL743	DC-10	N908	ANC	HNL	370	60		recorder failure					5'17"		
6-4-78	UAL107	B-747	N4735	JFK	ORD	390	70	0.29	0.22	0.20	0.19	0.18	0.14	1'50"	1'20"	cockpit
6-4-78	UAL993	B-747	N4714	ORD	HNL	350/370	53/63	0.22	0.18	0.19	0.15	0.09	0.07	8'29"	5'35"	

*FL in hundreds of feet

**CA in hundreds of feet

TABLE 2. Summary of Results Obtained During the FAA Cabin Ozone Monitoring Program, 1979.

Date	Flight	A/C	Number	Orig.	Dest.	Min-Max *FL	Min-Max **CA	Max Ozone CA	Max Ozone SL	Max Hour Average CA	Max Hour Average SL	Flight Average CA	Flight Average SL	Flight Time	Monitor Time	Ozone Monitor Inlet Location
1-11-79	UAL614	B-727	N7627	SFO	SEA	310/350	40/58	0.12	0.10	0.07	0.06	0.06	0.05	1'33"	1'33"	cockpit 36"fr fl
1-14-79	ASA99	B-727	N320AS	SEA	FAI	350	56	0.12	0.10	0.07	0.06	0.05	0.04	3'37"	3'00"	1st cl eye level
1-16-79	ASA99	B-727	N314AS	SEA	FAI	350	55	0.09	0.08	0.08	0.07	0.06	0.05	3'33"	3'33"	1st cl eye level
1-16-79	ASA88	B-727	N316AS	FAI	SEA	350/370	68	0.11	0.09	0.10	0.08	0.08	0.06	3'00"	3'00"	cabin eye level
1-17-79	ASA99	B-727	N318AS	SEA	FAI	350	54	0.22	0.18	0.20	0.16	0.11	0.09	3'09"	3'09"	cabin 6"below EL
1-17-79	ASA88	B-727	N293AS	FAI	SEA	330/370	68	0.28	0.22	0.23	0.18	0.16	0.12	3'14"	3'11"	cabin eye level
1-17-79	UAL603	B-727	N7641U	SEA	SFO	370	63	0.11	0.09	0.09	0.07	0.06	0.05	1'39"	1'39"	cockpit jumpseat
1-23-79	WAL175	B-737	N4526W	SFO	LAS	330	74	recorder failure						1'05"		coach
1-23-79	WAL109	B-737	N4526W	LAS	LAX	240	31	recorder failure						0'37"		coach
1-24-79	CAL10	B-727	N69740	LAX	DEN	330	51	0.04	0.03	0.04	0.03	0.03	0.02	1'42"	1'42"	coach
1-25-79	CAL607	DC-10	N68044	DEN	LAX	350	50	0.17	0.14	0.15	0.13	0.11	0.09	2'09"	2'09"	coach
1-26-79	CAL62	B-727	N93738	LAX	PHX	330	48	0.04	0.03	-	-	0.02	0.01	0'53"	0'53"	coach
1-26-79	CAL57	B-727	N40487	PHX	LAX	280	50	0.05	0.04	-	-	0.03	0.02	0'58"	0'58"	coach
1-29-79	CAL74	B-727	N88702	LAX	TUS	290	32	0.05	0.04	-	-	0.03	0.02	0'59"	0'59"	coach
1-29-79	CAL74	B-727	N88702	TUC	ELP	270	37	0.03	0.03	-	-	0.03	0.02	0'38"	0'38	coach
1-29-79	CAL74	B-727	N88702	ELP	SAT	330	48	0.08	0.07	-	-	0.04	0.04	1'00"	1'00"	coach
1-30-79	CAL227	B-727	N40483	SAT	LAX	260/280	27/35	0.17	0.16	0.08	0.07	0.06	0.05	2'56"	2'56"	coach
2-1-79	CAL28	B-727	N40486	LAX	MCI	370	65	recorder failure						2'20"		coach
2-1-79	CAL31	B-727	N40486	MCI	LAX	310/350	60	recorder failure						2'34"		coach
2-2-79	WAL521	DC-10	N906WA	SFO	HNL	310	34/37	0.07	0.06	0.06	0.05	0.05	0.04	4'33"	4'33"	coach
2-5-79	CAL604	DC-10	N68056	HNL	LAX	340	48	0.16	0.14	0.11	0.09	0.07	0.06	4'44"	4'44"	cockpit
2-6-79	WAL452	B-737	N4519W	LAX	SMF	280	51	0.07	0.05	0.05	0.04	0.04	0.03	1'03"	1'03"	coach
2-6-79	WAL453	B-737	N4519W	SMF	LAX	330	73	0.08	0.07	-	-	0.04	0.03	0'53"	0'53"	cabin
2-6-79	DAL447	B-727	N1641	CLE	ATL	350	55	recorder failure						1'47"		cockpit
2-7-79	DAL1009	L-1011	N709DA	ATL	DEN	260/350	53/60	0.19	0.15	0.10	0.08	0.09	0.08	2'43"	1'17"	cockpit
2-7-79	DAL1010	L-1011	N709DA	DEN	ATL	330/370	64	recorder failure						2'23"		cockpit
2-9-79	DAL1149	L-1011	N702DA	ATL	MCO	290/330	45/50	0.10	0.08	-	-	0.05	0.04	0'55"	0'43"	cockpit
2-9-79	DAL1046	L-1011	N702DA	MCO	ATL	290	34	0.04	0.04	-	-	0.02	0.02	1'05"	0'41"	cockpit
2-12-79	WAL719	DC-10	N905WA	LAX	SEA	350	50	0.07	0.05	0.05	0.04	0.04	0.04	2'01"	2'01"	coach
2-12-79	SOU151	DC-9	N9357	ATL	MEM	260	42/45	0.04	0.04	-	-	0.02	0.02	0'57"	0'57"	cockpit
2-12-79	WAL633	B-727	N2809W	SEA	LAX	330/370	61/64	0.09	0.07	0.08	0.06	0.07	0.05	2'16"	2'16"	coach
2-13-79	SOU342	DC-9	N908H	MEM	DEN	310	68	recorder failure						2'27"		cockpit
2-13-79	WAL514	B-727	N2814W	LAX	MSP	330	50	recorder failure						2'47"		1st class
2-13-79	SOU235	DC-9	N908H	DEN	ICT	330	77	recorder failure						0'56"		cockpit
2-13-79	SOU235	DC-9	N908H	ICT	MEM	330	78	recorder failure						1'04"		cockpit
2-13-79	WAL503	B-727	N2803W	MSP	LAX	350	56	0.07	0.06	0.06	0.05	0.05	0.04	3'25"	3'25"	1st class
2-14-79	SOU356	DC-9	N8906E	MEM	MSP	310	68	0.03	0.02	0.02	0.02	0.02	0.01	1'55"	1'36"	cockpit
2-14-79	SOU171	DC-9	N8906E	MSP	MEM	310/330	65/75	0.05	0.04	0.04	0.03	0.02	0.02	1'37"	1'27"	cockpit
2-14-79	WAL84	B-720	N3165	LAX	SFO	300/330	40/50	0.20	0.17	-	-	0.09	0.08	0'56"	0'56"	coach
2-15-79	SOU152	DC-9	N3314L	MEM	ATL	330	75	0.05	0.04	-	-	0.02	0.02	0'55"	0'55"	cockpit
2-15-79	SOU510	DC-9	N955	MEM	MKE	330	78	0.05	0.04	0.03	0.02	0.03	0.02	1'15"	1'07"	cockpit
2-15-79	SOU373	DC-9	N955	MKE	MEM	350	82/85	0.06	0.04	0.04	0.03	0.04	0.03	1'24"	1'24"	cockpit
2-16-79	DAL1728	DC-9	N1262L	ATL	JFK	330	75	0.08	0.06	0.06	0.04	0.04	0.03	1'38"	1'38"	cockpit
2-23-79	EAL27	A-300	N204	JFK	MIA	310	55	0.07	0.05	0.04	0.03	0.04	0.03	2'25"	1'57"	seatback
2-26-79	EAL89	L-1011	N331EA	MIA	LGA	330	55	recorder failure						2'03"		seat eye level
2-26-79	EAL17	L-1011	N331EA	LGA	MIA	350	55	recorder failure						2'35"		flight deck EL
2-27-79	UAL521	B-737	N9018U	SFO	LAX	290	50	0.13	0.11	-	-	0.05	0.04	0'49"	0'49"	baggage compt.
2-27-79	EAL892	L-1011	N333EA	MIA	LGA	260/330	35/50	0.14	0.12	0.08	0.07	0.05	0.04	2'36"	2'36"	flight deck EL
2-27-79	EAL17	L-1011	N333EA	LGA	MIA	390	75	recorder failure						2'17"		coach
2-28-79	965	B-737	N9003U	PDX	SLE	70	2	recorder failure						0'26"		baggage compt.
2-28-79	965	B-737	N9003U	SLE	MFR	210	18	recorder failure						0'30"		baggage compt.
2-28-79	965	B-737	N9003U	MFR	SFO	290	57	recorder failure						1'03"		baggage compt.
2-28-79	EAL892	L-1011	N334EA	MIA	LGA	370	62	0.06	0.05	0.04	0.03	0.03	0.02	2'19"	1'45"	flight deck EL
2-28-79	UAL500	B-737	N9061U	LAX	SFO	280	49	0.05	0.04	-	-	0.02	0.02	0'54"	0'54"	baggage compt.
2-28-79	EAL17	L-1011	N334EA	LGA	MIA	350	55	0.06	0.05	0.05	0.04	0.04	0.03	2'23"	2'23"	seat eye level

*FL in hundreds of feet

**CA in hundreds of feet

TABLE 2 (con't). Summary of Results Obtained During the FAA Cabin Ozone Monitoring Program, 1979.

Date	Flight	A/C	Number	Orig.	Dest.	Min-Max *FL	Min-Max **CA	Max Ozone		Max Hour Average		Flight Average		Flight Time	Monitor Time	Ozone Monitor Inlet Location
								CA	SL	CA	SL	CA	SL			
2-28-79	UAL884	B-737	N9003U	SFO	MFR	280	50	0.08	0.07	-	-	0.05	0.04	0'48"	0'36"	baggage compt.
2-28-79	UAL884	B-737	N9003U	MFR	SLE	200	12		recorder failure					0'32"		baggage compt.
2-28-79	UAL884	B-737	N9003U	SLE	PDX	70	2		recorder failure					0'13"		baggage compt.
3-1-79	VAL210	DC-8	N8057U	DEN	EWR	370	67	0.18	0.14	0.12	0.10	0.09	0.07	3'04"	3'04"	1st class
3-1-79	EAL892	L-1011	N320EA	MIA	LGA	370	68	0.19	0.15	0.10	0.08	0.07	0.05	2'10"	2'10"	seat back
3-2-79	UAL123	DC-10	N1824U	EWR	ORD	310	84		recorder failure					2'07"		coach
3-2-79	UAL723	DC-10	N1805U	ORD	LAS	350/390	86/87	0.32	0.23	0.22	0.16	0.12	0.08	3'14"	3'14"	cockpit
3-2-79	UAL218	DC-10	N1805U	LAS	ORD	330/350	85/86	0.30	0.22	0.19	0.13	0.10	0.07	3'32"	2'52"	cockpit
3-3-79	UAL193	B-747	N4713U	ORD	DEN	350	53/56	0.21	0.17	0.12	0.10	0.10	0.08	1'58"	1'58"	coach
3-4-79	UAL193	B-747	N4732U	DEN	LAX	390	60	0.24	0.19	0.15	0.12	0.10	0.08	1'47"	1'47"	coach
3-5-79	UAL779	DC-8	N8089U	ORD	OMA	350	54	0.25	0.20	-	-	0.09	0.07	0'57"	0'57"	coach
3-5-79	UAL336	DC-8	N8089U	OMA	ORD	330	46	0.09	0.08	0.03	0.03	0.03	0.03	1'10"	1'10"	coach
3-5-79	UAL336	DC-8	N8089U	ORD	BOS	330/370	46/60	0.19	0.16	-	-	0.11	0.08	1'44"	0'43"	coach
3-5-79	UAL145	DC-8	N8089U	BOS	ORD	350	52/53	0.19	0.16	0.11	0.09	0.08	0.07	2'14"	2'14"	coach
3-6-79	UAL141	B-727	N7293U	ORD	PDX	310	50	0.14	0.11	0.09	0.07	0.05	0.04	3'40"	3 40"	coach
3-6-79	NAL136	DC-10	N69	MIA	LGA	370	68	0.04	0.03	0.03	0.02	0.02	0.02	2'40"	2'40"	front of coach
3-6-79	NAL91	DC-10	N65	LGA	MIA	390	69	0.08	0.07	0.05	0.04	0.04	0.03	2'43"	2'43"	coach
3-7-79	NAL183	DC-10	N62	MIA	IAH	390	72		recorder failure					2'26"		seat back
3-7-79	NAL183	DC-10	N62	IAH	SFO	350/390	59/72		recorder failure					3'38"		seat back
3-7-79	UAL344	B-727	N7079U	LAX	BHM	370	64	0.27	0.21	0.19	0.15	0.09	0.07	3'36"	3'36"	seat back
3-7-79	UAL344	B-727	N7079U	BHM	RDU	290	36	0.10	0.09	0.05	0.04	0.05	0.04	1'01"	1'01"	seat back
3-8-79	UAL245	B-727	N7290U	CLE	ROC	230	50	0.04	0.03	-	-	0.01	0.01	0'45"	0'45"	coach
3-8-79	UAL245	B-727	N7290U	ROC	MIA	320/350	52/68	0.16	0.13	0.10	0.08	0.10	0.08	2'40"	1'24"	coach
3-8-79	UAL990	B-727	N7290U	MIA	ROC	370	63		recorder failure					2'27"		coach
3-8-79	NAL52	DC-10	N66	SFO	MIA	370	64		recorder failure					4'34"		coach
3-8-79	UAL669	B-727	N7290U	ROC	FLL	350	56	0.27	0.22	0.16	0.13	0.10	0.08	2'32"	2'32"	
3-9-79	NAL138	DC-10	N63	MIA	LGA	370	64	0.17	0.13	0.10	0.08	0.06	0.05	2'14"	2'14"	seat back
3-9-79	UAL748	B-727	N7282U	TPA	PIT	330/370	50/60		recorder failure					1'52"		seat back
3-9-79	UAL768	B-727	N708U	PIT	ORD	310	43		recorder failure					1'17"		cockpit
3-12-79	NWA235	B-727	N260US	LGA	MSP	350	60	0.05	0.04	0.02	0.02	0.01	0.01	2'40"	2'40"	cabin
3-14-79	NWA726	B-727	N494US	MSP	ATL	250/330	23/55	0.14	0.12	0.06	0.05	0.05	0.05	2'03"	2'03"	1st class
3-14-79	NWA705	B-727	N494US	ATL	MSP	370/350	47/60	0.19	0.15	0.11	0.09	0.09	0.07	2'16"	2'16"	1st class
3-14-79	AAL295	B-727	N835	DFW	ELP	350	58	0.05	0.04	0.03	0.03	0.02	0.02	1'29"	1'29"	aft coach
3-14-79	AAL228	B-727	N835	ELP	DFW	370	60	0.08	0.06	0.02	0.02	0.02	0.02	1'07"	1'07"	aft coach
3-15-79	NWA459	B-727	N473US	MSP	YEG	350/390	60/72	0.16	0.13	0.11	0.08	0.09	0.07	2'35"	2'20"	1st class
3-15-79	AAL27	B-727	N842	DFW	LAX	310/350	50/58		recorder failure					2'45"		aft coach
3-15-79	AAL152	B-727	N842	LAX	DFW	330/370	58	0.07	0.06	0.04	0.03	0.03	0.03	2'23"	2'23"	aft coach
3-15-79	NWA458	B-727	N473US	YEG	MSP	350/370	68	0.10	0.08	0.08	0.06	0.05	0.04	2'12"	2'12"	1st class
3-16-79	NWA21	B-747	N611	MSP	LAX	390	63	0.19	0.15	0.14	0.11	0.10	0.08	3'26"	3'26"	coach
3-16-79	NWA21	B-747	N611/2	LAX	HNL	370/390	57/63	0.15	0.12	0.08	0.07	0.07	0.05	5'20"	4'51"	coach
3-17-79	NWA22	B-747	N607/1	LAX	MSP	370	57	0.33	0.27	0.24	0.19	0.15	0.12	2'59"	2'43"	coach
3-17-79	NWA22	B-747	N607US	HNL	LAX	350	50	0.10	0.08	0.06	0.05	0.05	0.04	4'31"	4'31"	coach
3-20-79	NWA228	B-727	N479US	MSP	LGA	330/370	50/63	0.09	0.07	0.06	0.05	0.04	0.03	2'06"	2'06"	cabin
3-20-79	NWA229	B-727	N479US	LGA	MSP	350/410	55/72	0.15	0.11	0.11	0.09	0.09	0.07	2'23"	2'23"	cabin
3-23-79	NWA23	DC-10	N148US	MSP	ANC	350/390	55/67	0.34	0.26	0.23	0.18	0.12	0.09	5'17"	5'17"	cabin
3-23-79	NWA24	DC-10	N148US	ANC	MSP	370	60	0.47	0.38	0.34	0.27	0.13	0.10	4'32"	4'32"	1st class
3-75-79	NCA35	DC-9	N953	DTW	IAH	350	82	0.15	0.11	0.09	0.07	0.07	0.05	2'19"	2'19"	cabin
3-25-79	NWA54	DC-10	N154US	MSP	DTW	370	62	0.22	0.18	0.08	0.06	0.07	0.05	1'10"	1'10"	1st class
3-26-79	NCA36	DC-9	N953	IAH	DTW	330	75	0.11	0.09	0.08	0.06	0.06	0.04	2'14"	2'05"	aft cabin
3-26-79	NCA905	DC-9	N959	DTW	ATL	330	80		recorder failure					1'27"		rear seat
3-26-79	NCA959	DC-9	N959	ATL	DTW	330/350	83	0.13	0.10	0.05	0.04	0.04	0.03	1'25"	1'25"	rear seat
3-27-79	NCA970	DC-9	N943	DTW	BOS	330	72/76	0.11	0.08	0.06	0.05	0.05	0.04	1'18"	1'18"	rear seat
3-27-79	NCA931	DC-9	N943	BOS	DTW	220	21/23	0.07	0.06	0.04	0.04	0.03	0.03	2'07"	2'07"	rear seat
3-28-79	BNF293	B-727	N7280	DTW	CRP	370			recorder failure					0'56"		coach

TABLE 2 (con't). Summary of Results Obtained During the FAA Cabin Ozone Monitoring Program, 1979.

Date	Flight	A/C	Number	Orig.	Dest.	Min-Max *FL	Min-Max **CA	Max Ozone		Max Hour Average		Flight Average		Flight Time	Monitor Time	Ozone Monitor Inlet Location
								CA	SL	CA	SL	CA	SL			
4-3-79	PAA100	B-747	N738	JFK	LHR	330	44	0.25	0.23	0.19	0.17	0.10	0.10	6'16"	5'54"	economy coach
4-4-79	PAA1	B-747	N742	LHR	JFK	310/330	32/40	0.27	0.24	0.20	0.13	0.11	0.10	7'13"	6'51"	coach on hdrest
4-5-79	PAA100	B-747	N902	JFK	LHR	370	54/57	0.37	0.30	0.26	0.21	0.22	0.18	6'06"	5'47"	coach
4-6-79	PAA1	B-747	N732	LHR	JFK	310/370	40/53	0.28	0.24	0.23	0.20	0.12	0.10	6'58"	6'34"	coach on hdrest
4-9-79	TWA495	B-727	N84TN	LGA	STL	350	62	0.18	0.14	0.10	0.08	0.08	0.06	2'07"	1'47"	coach
4-10-79	TWA91	L-1011	N41012	STL	LAX	350/390	58/70	0.34	0.27	0.27	0.2?	0.20	0.16	3'17"	2'45"	coach
4-10-79	TWA80	L-1011	N31022	LAX	STL	370	63	0.13	0.10	0.10	0.08	0.07	0.06	3'12"	2'52"	coach
4-11-79	TWA563	L-1011	N31013	STL	LAS	350/370	55/62	0.33	0.27	0.26	0.21	0.17	0.14	2'53"	2'46"	coach
4-16-79	TWA111	B-707	N18710	MCI	PHX	390/410	70/80	0.17	0.13	0.09	0.07	0.07	0.05	2'30"	2'13"	coach
4-17-59	TWA111	B-707	N18703	MCI	PHX	410	73	0.31	0.24	0.22	0.17	0.16	0.12	2'40"	2'22"	coach
4-17-79	TWA110	B-727	N849TW	PHX	MCI	330/370	70	0.12	0.09	0.09	0.07	0.06	0.05	2'20"	2'16"	coach
4-18-79	TWA427	B-727	N7856	MCI	LAS	350	65	recorder failure								
4-23-79	DAL525	B-727	N472DA	JFK	ATL	310	42	0.04	0.03	0.02	0.02	0.02	0.02	2'30"	1'43"	cockpit
4-24-79	DAL1027	L-1011	N720DA	ATL	SFO	350	60	0.16	0.13	0.10	0.08	0.08	0.07	4'32"	4'23"	cockpit
4-25-79	DAL1126	L-1011	N718DA	SFO	ATL	330/370	50/64	0.17	0.14	0.09	0.07	0.05	0.04	3'48"	3'37"	cockpit
4-26-79	DAL1032	L-1011	N724DA	ATL	ORD	350	58	0.09	0.08	0.06	0.05	0.05	0.04	1'19"	1'19"	cockpit
4-26-79	DAL1031	L-1011	N724DA	ORD	ATL	370	50	0.10	0.08	0.06	0.05	0.05	0.04	1'43"	1'43"	cockpit
4-27-79	DAL1844	DC-8	N805E	ATL	DTW	290/330	40/49	0.27	0.23	0.12	0.10	0.10	0.08	1'16"	1'16"	cockpit
4-27-79	DAL1835	DC-8	N805E	DTW	ATL	310/370	50/63	0.29	0.24	0.16	0.13	0.13	0.10	1'25"	1'25"	cockpit
4-30-79	AA82	B-727	N6807	DFW	LGA	290/330		recorder failure						1'46"		rear cabin
4-30-79	DAL1117	L-1011	N710DA	ATL	LAX	310/350	57	0.12	0.10	0.08	0.06	0.06	0.05	4'15	4'15"	cockpit
5-1-79	DAL1020	L-1011	N718DA	LAX	ATL	330/370	50/64	0.11	0.09	0.10	0.08	0.08	0.06	3'18"	3'18"	cockpit
5-1-79	AA293	B-727	N6809	LGA	ORD	310/350	68	0.12	0.09	0.08	0.06	0.05	0.03	1'48"	1'45"	cockpit
5-1-79	AA257	B-707	N7588A	ORD	SFO	390	76	0.26	0.19	0.22	0.16	0.17	0.12	4'00"	4'00"	cockpit
5-2-79	AA634	B-707	N7577A	SFO	PHX	330/370	65/69	0.26	0.20	0.19	0.15	0.13	0.10	1'26"	1'26"	rear cabin
5-2-79	AA634	B-707	N7577A	PHX	DFW	390/410	74/77	0.03	0.02	0.02	0.01	0.01	0.01	1'51"	1'51"	rear cabin
5-3-79	DAL1009	L-1011	N725DA	ATL	DEN	290	42	0.07	0.07	0.05	0.04	0.03	0.03	2'41"	2'41"	cockpit
5-3-79	DAL1010	L-1011	N725DA	DEN	ATL	370	66	0.19	0.15	0.09	0.07	0.07	0.05	2'29"	2'23"	cockpit
5-4-79	DAL644	B-727	N479DA	ATL	CLE	290	30	0.03	0.03	0.02	0.02	0.02	0.02	1'06"	1'06"	cockpit
5-4-79	AAL424	B-727	N1973	DFW	CLE	330/390	68/78	0.03	0.02	0.02	0.01	0.02	0.01	1'51"	1'51"	rear cabin
5-9-79	EAL17	B-727	N115	LGA	MIA	350	65	0.10	0.08	0.06	0.06	0.07	0.04	2'35"	2'35"	coach
5-10-79	EAL501	L-1011		MIA	SFO	350	52	0.40	0.33	0.27	0.22	0.14	0.11	5'17"	5'17"	flight deck
5-11-79	EAL500	L-1011		SFO	MIA	370	60	0.27	0.22	0.18	0.15	0.10	0.08	4'28"	4'24"	coach
5-16-79	NAL52	DC-10	N 63	SFO	MIA	370	66	0.13	0.11	0.11	0.09	0.09	0.07	4'55"	4'55"	coach
5-17-79	NAL10	DC-10	N80NA	MIA	FRA	310/390	44/62	0.31	0.25	0.29	0.24	0.13	0.11	8'51"	8'51"	coach
5-19-79	NAL9	DC-10	N80NA	FRA	MIA	280/370	44/62	0.25	0.21	0.24	0.20	0.12	0.10	9'55"	9'27"	coach
5-21-79	PAA815	B-747	N750	JFK	LAX	350/390	48/61	0.16	0.13	0.09	0.08	0.08	0.07	5'12"	5'12"	coach
5-22-79	PAA120	B-747	N748	LAX	LHR	330	43	0.33	0.28	0.29	0.24	0.14	0.12	10'10"	10'10"	coach
5-24-79	PAA001	B-747	N739	LHR	JFK	310/370	38/56	0.32	0.27	0.23	0.20	0.14	0.12	7'31"	7'31"	coach

*FL in hundreds of feet

**CA in hundreds of feet

TABLE 3. Listing of Location Identifiers, Names and Geographical Coordinates for Origination and Destination Airports of Flights Monitored During the FAA Cabin Ozone Monitoring Program

1.	ANC	Anchorage Intl	61-10N	149-59W
2.	ATL	The William B. Hartsfield Atlanta Intl	33-38N	84-26W
3.	AUS	Robert Mueller Muni (Austin)	30-18N	97-42W
4.	BAH	Bahrain Intl, Bahrain	26-16N	50-38E
5.	BHM	Birmingham Muni	33-34N	86-45W
6.	BOI	Boise Air Terminal - Gowen Fld	43-34N	116-13W
7.	BOS	General Edward Lawrence Logan Intl (Boston)	42-22N	71-00W
8.	CLE	Cleveland-Hopkins Intl	41-25N	81-51W
9.	CRP	Corpus Christi Intl	27-46N	97-30W
10.	DEN	Stapleton Intl (Denver)	39-46N	104-53W
11.	DFW	Dallas-Ft Worth Regional	32-54N	97-02W
12.	DTW	Detroit Metropolitan Wayne Company	42-13N	83-21W
13.	ELP	El Paso Intl	31-48N	106-23W
14.	EWR	Newark Intl	40-42N	74-10W
15.	FAI	Fairbanks Intl	64-49N	147-51W
16.	FLL	Ft Lauderdale-Hollywood Intl	26-04N	80-09W
17.	FRA	Frankfurt/Main, Federal Republic of Germany	50-02N	08-34E
18.	HKG	Hong Kong Kaitak Intl, Hong Kong	22-19N	114-12E
19.	HND	Tokyo Intl (Haneda) Japan	35-32N	139-46E
20.	HNL	Honolulu Intl	21-20N	157-56W
21.	IAD	Dulles Intl (Washington, D.C.)	38-57N	77-27W
22.	IAH	Houston Intercontinental	29-59N	95-21W
23.	ICT	Wichita Mid-Continent	37-39N	97-26W
24.	JFK	John F. Kennedy Intl (New York)	40-38N	73-47W
25.	LAS	McCarran Intl (Las Vegas)	36-05N	115-09W
26.	LAX	Los Angeles Intl	33-57N	118-24W
27.	LGA	LaGuardia (New York)	40-47N	73-52W
28.	LGW	London, Gatwick, Great Britain	51-09N	00-11W
29.	LHR	London, Heathrow, Great Britain	51-28N	00-27W
30.	MCI	Kansas City Intl	39-18N	94-43W
31.	MCO	Orlando Intl	28-26N	81-19W
32.	MEM	Memphis Intl	35-03N	89-59W
33.	MFR	Medford-Jackson Co (Manzanita, Oregon)	42-22N	122-52W
34.	MIA	Miami Intl	25-48N	80-17W
35.	MKE	General Mitchell Fld (Milwaukee)	42-57N	87-54W
36.	MSP	Minneapolis-St Paul Intl/Wold-Chamberlain	44-53N	93-13W
37.	OMA	Eppley Airfield (Omaha)	41-18N	95-54W
38.	ORD	Chicago-O'Hare Intl	41-59N	87-54W
39.	PDX	Portland Intl	45-35N	122-36W
40.	PHX	Phoenix Sky Harbor Intl	33-26N	112-01W
41.	PIT	Greater Pittsburgh Intl	40-30N	80-14W
42.	RDU	Raleigh-Durham	35-52N	78-47W
43.	ROC	Rochester-Monroe Co	43-07N	77-40W
44.	SAT	San Antonio Intl	29-32N	98-28W
45.	SEA	Seattle-Tacoma Intl	47-27N	122-18W
46.	SFO	San Francisco Intl	37-37N	122-22W
47.	SLC	Salt Lake City Intl	40-47N	111-58W
48.	SLE	McNary Fld (Salem)	44-55N	123-00W
49.	SMF	Sacramento Metropolitan	38-42N	121-36W
50.	STL	Lambert-St Louis Intl	38-45N	90-22W
51.	TPA	Tampa Intl	27-58N	82-32W
52.	TUS	Tucson Intl	32-07N	110-57W
53.	YEG	Edmonton Intl, Canada	53-19N	113-35W

TABLE 4. Summary of the Results Obtained During the FAA Cabin Ozone Monitoring Program by Aircraft Type with the Number of Flights Exceeding the Limits Established by Section 121.578 of the FAR's.

Aircraft type	ALL FLIGHTS		FLIGHTS GREATER THAN 4 HOURS	
	Number of flights	Flights with ozone greater than 0.25 ppmv (SLE)	Number of flights	Flights with TWA ozone greater than 0.10 ppmv (SLE)
707/720	9	1	3	2
727	41	0	0	
737	5	0	0	
747	27	4	21	6
747SP	7	1	7	0
DC-8	11	0	0	
DC-9	12	0	0	
DC-10	22	2	13	1
L-1011	22	3	5	1
A-300	1	0	0	
TOTALS	157	11	49	10

TABLE 5. Summary of All Data Obtained During the FAA Cabin Ozone Monitoring Program as a Function of Maximum Flight Level and Latitude Flown by Aircraft Type.

FL \ LAT	≦32½	35	40	45	50	55	≧57½	≦32½	35	40	45	50	55	≧57½
				B-707/720							B-727			
430														
410		I	II		⊠						I			
390			I							I			I	
370			I		⊠				III	II	III		I	II
350							⊗		I	III	IIIIII			III
330			I					I	I	II	I			
310										I	I			
290								I	IIII	I	I			
				B-737							B-747			
430														
410														
390									XX	XI⊠IIX	XI	⊠X⊠		
370									X	X	Ⓘ	XX⊠X⊠		
350									XX	I				
330			I									XX⊠		
310														
290			IIII											
				B-747SP							DC-8			
430		X	X											
410			XX⊗											
390			XX								I			
370										II	I			
350										III	II			
330										II				
310														
290														
				DC-9							DC-10			
430														
410														
390										II	X	⊠		⊗
370									X	IIX	II	X		⊗
350		II		I					X	XII	XI	X		
330		II	I	III										
310				I						XX				
290		I		I										
				L-1011							A-300			
430														
410														
390			Ⓘ											
370		I	IXIIIⒾIIX											
350		X	IIXI⊠											
330		I	II											
310														
290										I				
		I	I											

I - Flight less than 4 hours

X - Flight greater than 4 hours

) - Measured value exceeds the maximum ozone concentration established by Section 121.578 of the FAR's

☐ - Measured value exceeds the time-weighted average limit established by Section 121.578 of the FAR's

TABLE 6. Summary of all Data Obtained During the FAA Cabin Ozone Monitoring Program as a Function of Maximum Flight Level and Latitude Flown.

All flights and the number that exceed the maximum ozone concentration established by Section 121.578 of the FAR's (0.25 ppmv, SLE).

FL \ Lat	≤ 32½N	35N	40N	45N	50N	55N	≥ 57½N	TOTALS
430		1 - 0	1 - 0					2 - 0
410		1 - 0	5 - 1	1 - 0	1 - 0			8 - 1
390		2 - 0	13 - 1	4 - 0	4 - 0*	1 - 0	1 - 1	25 - 2
370		6 - 0	18 - 1*	7 - 1	7 - 2	1 - 0	3 - 1	42 - 5
350		7 - 0	15 - 1	11 - 0	1 - 0*		4 - 1	38 - 2
330	1 - 0	4 - 0	9 - 0	4 - 0	3 - 1			21 - 1
310			4 - 0	2 - 0				6 - 0
≥ 290	1 - 0	6 - 0	6 - 0	2 - 0				15 - 0
TOTALS	2 - 0	27 - 0	71 - 4	31 - 1	16 - 3	2 - 0	8 - 3	157 - 11

* These flights also exceed the time-weighted average ozone concentration established by Section 121.578 of the FAR's.

All flights greater than 4 hours and the number that exceed the time-weighted average established by Section 121.578 of the FAR's (0.10 ppm, SLE).

FL \ Lat	≤ 32½N	35N	40N	45N	50N	55N	≥ 57½N	TOTALS
430		1 - 0	1 - 0					2 - 0
410			3 - 0		1 - 1			4 - 1
390		2 - 0	5 - 1	2 - 0	4 - 3		1 - 0	14 - 4
370		2 - 0	4 - 0		7 - 3		1 - 0	14 - 3
350		4 - 0	3 - 1	1 - 0	1 - 0		1 - 0	10 - 1
330					3 - 1			3 - 1
310			2 - 0					2 - 0
≥ 290								0
TOTALS	0	9 - 0	18 - 2	3 - 0	16 - 8	0	3 - 0	49 - 10

DATE
ILME